

- Label** (20 bits) · Unique label value
- Experimental/QoS** (3 bits) · CoS-mapped QoS marking
- Bottom of Stack** (1 bit) · Indicates label is last in the stack
- Time To Live** (8 bits) · Hop counter mapped from IP TTL

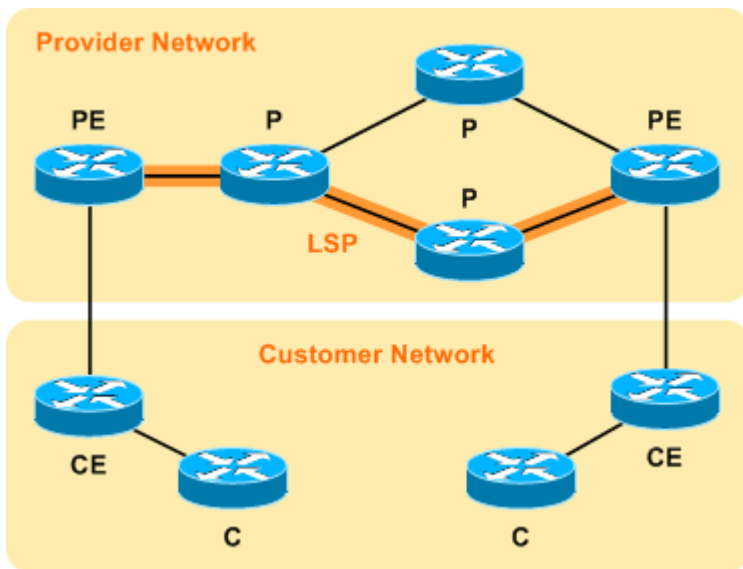
Conceptual Components

- Control Plane** · Facilitates label exchange between neighboring LSRs using LDP or TDP (includes the distribution protocol and LIB)
- Forwarding/Data Plane** · Forwards packets based on label or destination IP address (includes the FIB and LFIB)

Label Protocols

	LDP	TDP
Hello Address	224.0.0.2	255.255.255.255
Hello Port	UDP 646	UDP 711
Adjacency Port	TCP 646	TCP 711
Proprietary	No	Cisco

Label Switched Path



- Customer (C)** · IP-only routers internal to customer network
- Customer Edge (CE)** · C routers which face PE routers
- Provider Edge (PE)** · LSRs which form the MPLS-IP boundary
- Provider (P)** · MPLS-only LSRs in provider network

Terminology

- Label Distribution Protocol (LDP)** · Standards based label distribution protocol defined in RFC 3036
- Tag Distribution Protocol (TDP)** · Cisco's proprietary predecessor to LDP
- Label Switching Router (LSR)** · Any router capable of label switching
- Label-Switched Path (LSP)** · The unidirectional path through one or more LSRs taken by a label switched packet belonging to an FEC
- Forwarding Equivalence Class (FEC)** · A group of packets which are forwarded in an identical manner
- Label Information Base (LIB)** · Contains all labels known by an LSR via a label distribution protocol
- Forwarding Information Base (FIB)** · Routing database for unlabeled (IP) packets
- Label FIB (LFIB)** · Routing database for labeled packets
- Interim Packet Propagation** · An LSR temporarily performs IP routing while waiting to learn the necessary MPLS labels
- Penultimate Hop Popping (PHP)** · The second-to-last LSR in an LSP removes the MPLS label so the last LSR only has to perform an IP lookup

MPLS Configuration

```
! ** Enable CEF **
ip cef
!
! ** Select label protocol **
mpls label protocol ldp
!
! ** Enable MPLS on IP interfaces **
interface FastEthernet0/0
ip address 10.0.0.1 255.255.255.252
mpls ip
! ** Raise MPLS MTU to accomodate multilabel stack **
mpls mtu 1512
```

Troubleshooting

- show mpls interfaces
- show mpls ldp neighbors
- show mpls ldp bindings [detail] (LIB)
- show mpls forwarding-table [detail] (LFIB)
- show ip cef [detail] (FIB)
- debug mpls events
- debug mpls ldp bindings